

New Methodology Quantifies Non-Point Sources of Metal Pollutants in Stormwater

NAVFAC EXWC Approach Includes Site Characterization & Importing Data into Management Tool

THE NAVAL FACILITIES Engineering Command (NAVFAC), Engineering and Expeditionary Warfare Center (EXWC) has developed a Geographic Information System (GIS)-based methodology to identify and quantify non-point sources of metal pollutants in stormwater runoff.

The Department of the Navy is addressing a multitude of stormwater related issues regarding compliance with their National Pollutant Discharge Elimination System

requirements. (Benchmark concentrations are the level of a substance present in the water body, and acute toxicity levels are the concentrations at which the U.S. Environmental Protection Agency (EPA) has determined exposure to be harmful to aquatic life.) In most cases, copper and zinc are two metals that have been recognized through Toxicity Identification Evaluations as the primary cause of toxicity in Navy stormwater runoff.

pollution. The new GIS methodology developed by NAVFAC EXWC aids in the identification and quantification of non-point sources of metal pollutants.

At Naval Base San Diego (NBSD), copper concentrations in stormwater must not exceed 63.6 micrograms per liter ($\mu\text{g/L}$) and zinc concentrations must not exceed 117 $\mu\text{g/L}$. (Note: These are only benchmark concentrations and not limits. Copper and zinc benchmarks may

In many areas, stormwater runoff from industrial and non-industrial areas is mixed in common stormwater conveyances, making it difficult to pinpoint which entities may be responsible for elevated metals concentrations.

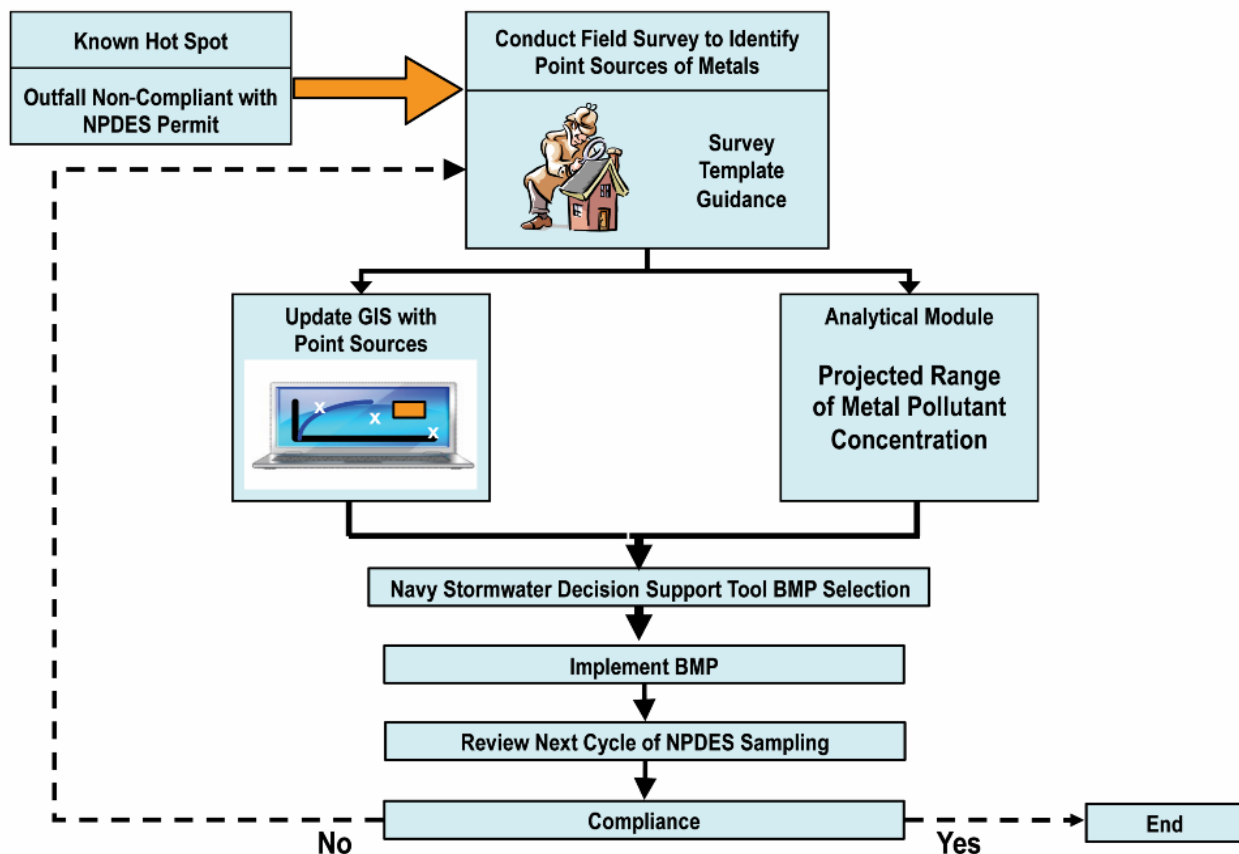
(NPDES) stormwater permits. Many Navy installations continue to struggle with NPDES permit requirements for stormwater due to low benchmark concentrations of metal pollutants in stormwater runoff from industrial areas and particularly stringent acute toxicity require-

In many areas, stormwater runoff from industrial and non-industrial areas is mixed in common stormwater conveyances, making it difficult to pinpoint which entities may be responsible for elevated metals concentrations. This is commonly known as non-point

be less stringent depending on the region in question.)

The Demonstration

The objective of this demonstration project was to provide NBSD and other applicable Naval bases with a GIS-based methodology and Non-

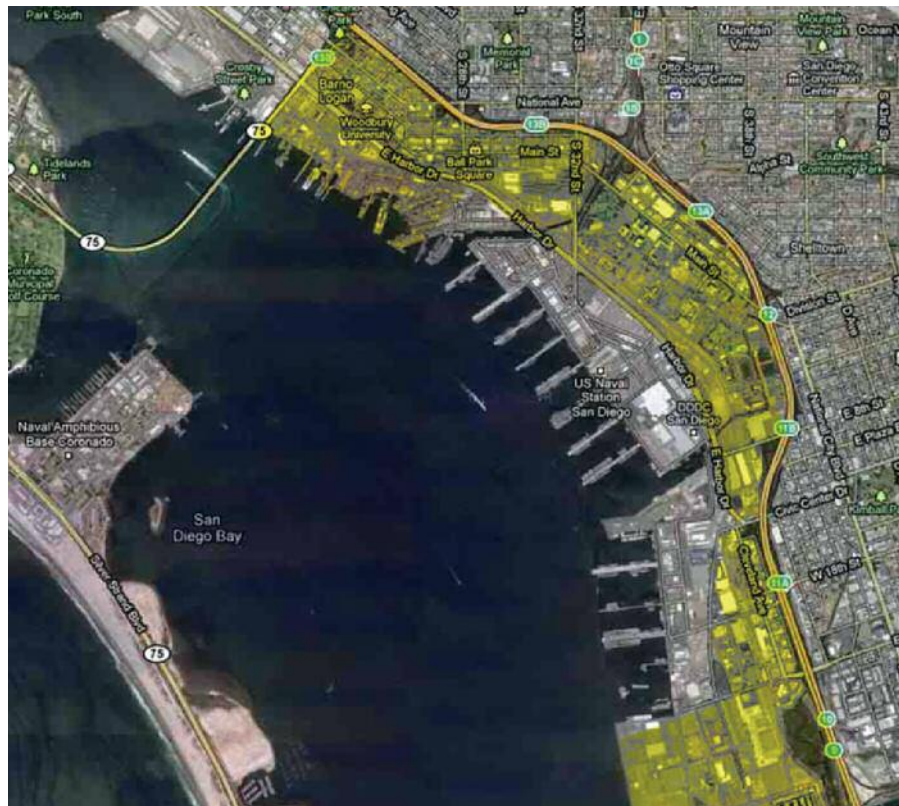


Methodology flowchart for identifying and quantifying stormwater pollutants.

point Source Stormwater Management (NPSSM) tool to help identify and quantify significant non-point sources of metal pollutants (particularly copper and zinc) that contribute to benchmark exceedances at stormwater outfalls.

A GIS approach was used for the following reasons:

- NAVFAC has an existing GIS infrastructure.
- GIS provides good visual display of results.
- The future of data management associated with maps is a GIS platform.
- The model is non-proprietary and requires very little maintenance.



Areas of potential concern for outfalls outside of Navy jurisdiction.

- GIS data may be uploaded onto the Navy's GIS server where Navy installations around the world may access the data.

During the demonstration, participants conducted site characterizations to identify potential metal pollutant point sources, particularly for copper and zinc. Using GIS and handheld Global Positioning System (GPS) technologies, key information such as industrial operations, building materials, traffic density, parking lot data, roadways, outside storage areas, etc. were captured on a survey template and imported into GIS software. The predictive tool calculates broad range estimates of potential metal concentrations, identifies potential material sources, and predicts which drainage basins need

the most attention. All data are incorporated into a decision support tool that enables selection of appropriate best management practices and/or nonstructural source reduction measures to comply with NPDES permit requirements.

More About the Tool


The function of the NPSSM tool is based on a multi-linear regression equation developed to model a pollutant (one was developed for copper and another for zinc). The equation includes explanatory variables that each represents a significant source of the pollutant as identified by statistical analysis such as building material, parking lot, and industrial activity. The statistical analysis involves taking all the potential sources of the pollutant

identified in the site characterization and narrowing down the possible sources to the most statistically relevant ones. In the equation, each coefficient represents the "weight" of the variable relative to each other. The tool also generates graphs of historical stormwater quality data along with management of stormwater quality data, records of inspections, and best management practices (BMP).

Project Benefits

The NPSSM tool utilizes an existing GIS platform, and may be uploaded onto the Navy's GIS server for access at Navy sites around the world. The tool provides a means for simplifying BMP assessments required by Stormwater Pollution Prevention Plans, and it's easy to use, providing a visual analysis (graphical display) of metal pollutant "hotspots."

Application of this methodology is recommended as an iterative process where user input is practical for identifying, eliminating, and mitigating point sources of metals in stormwater runoff. The cost of a handheld GIS/GPS device for use during BMP assessments formatted with BMP checklist is approximately \$10,000. The device may also be available for rental.

The development and validation of the stormwater runoff methodology for identifying metals was made possible by the Navy Environmental Sustainability Development to Integration (NESDI) program. 

The Basics About the NESDI Program

THE NESDI PROGRAM seeks to provide solutions by demonstrating, validating and integrating innovative technologies, processes, materials, and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness. The program accomplishes this mission through the evaluation of cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and ensure they can be integrated into weapons system acquisition programs.

The NESDI program is the Navy's environmental shoreside (6.4) Research, Development, Test and Evaluation program. The program is sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division and managed by NAVFAC EXWC in Port Hueneme, California. The program is the Navy's complement to the Department of Defense's Environmental Security Technology Certification Program which conducts demonstration and validation of technologies important to the tri-Services, EPA and the Department of Energy.

For more information, visit the NESDI program web site at www.nesdi.navy.mil or contact Ken Kaempffe, the NESDI Program Manager at 805-982-4893, DSN: 551-4893 or ken.kaempffe@navy.mil.



Vern Novstrup
Naval Facilities Engineering and
Expeditionary Warfare Center
805-982-1276
DSN: 551-1276
vern.novstrup@navy.mil